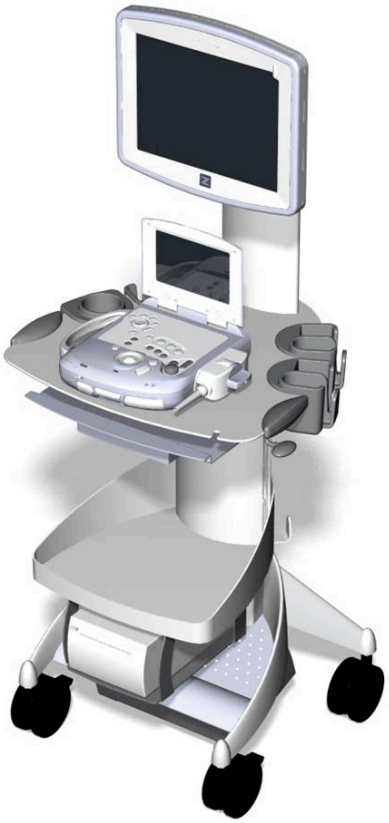
ZONARE

z.one

Diagnostic Ultrasound System

DICOM Conformance Statement



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CONFORMANCE STATEMENT OVERVIEW

This product, ZONARE z.one, implements the necessary DICOM services to download work lists from an information system, instruct an information system to create and update performed procedure steps, and store and print acquired ultrasound images to external DICOM applications.

The following table provides an overview of the network services supported by ZONARE z.one.

Table 1. Network Services

Networking SOP Classes	**User of Service (SCU)**	**Provider of Service (SCP)**
Transfer		
Ultrasound (US) Image Storage	Yes	No
Ultrasound (US) Multi-Frame Image Storage	Yes	No
Secondary Capture Image Storage	Yes	No
Workflow Management		
Modality Worklist Information Model - FIND	Yes	No
Modality Performed Procedure Step SOP Class	Yes	No
Print Management		
Basic Grayscale Print Management Meta	Yes	No
Basic Color Print Management Meta	Yes	No

Note: Support for network services is a separately licensable option.

The following table provides an overview of the Media Storage Application Profiles supported by ZONARE z.one.

Table 2. Media Storage Application Profiles

Media Storage Application Profile	**Writes Files (FSC or FSU)**	**Reads Files (FSR)**
USB		
ZONARE USB Interchange	Yes	Yes

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Section 1. Introduction

1.1. Revision History

Document Version	Date of Issue	Author	Description
1.0	Feb. 17, 2005	Stephen Marschall	Creation.
1.1	Feb. 17, 2005	Stephen Marschall	Updated.
1.5	Jun 17, 2005	Stephen Marschall	Updated.
1.6	Aug. 26, 2005	Stephen Marschall	Updated.
1.7	Nov. 16, 2005	Stephen Marschall	Updated.
2.0	Aug. 9, 2006	Stephen Marschall	Updated.

1.2. Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

1.3. Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with ZONARE and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between ZONARE and non-ZONARE equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. ZONARE Medical Systems reserves the right to make changes to its products or to discontinue its delivery.

1.4. Definitions, Terms, and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	DICOM Application Entity
ACSE	Association Control Service Element
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
IOD	DICOM Information Object Definition
ISO	International Standards Organization
LUT	Lookup Table
MPPS	Modality Performed Procedure Step
MWL	Modality Work List
PDU	DICOM Protocol Data Unit
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
TIFF	Tag Image File Format
UID	Unique Identifier
VM	Value Multiplicity
VR	Value Representation

1.5. References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2006

Section 2. Networking

2.1. Implementation Model

2.1.1. Application Data Flow Diagram

ZONARE z.one implements DICOM 3.0 functionality for storage to removable media, network storage to Picture Archive Systems (PACS), network printing to DICOM-compatible printers, patient demographic and scheduled procedure step retrieval from a Hospital Information System (HIS) or Radiology Information System (RIS), and creation and modification of performed procedure steps by a HIS/RIS.

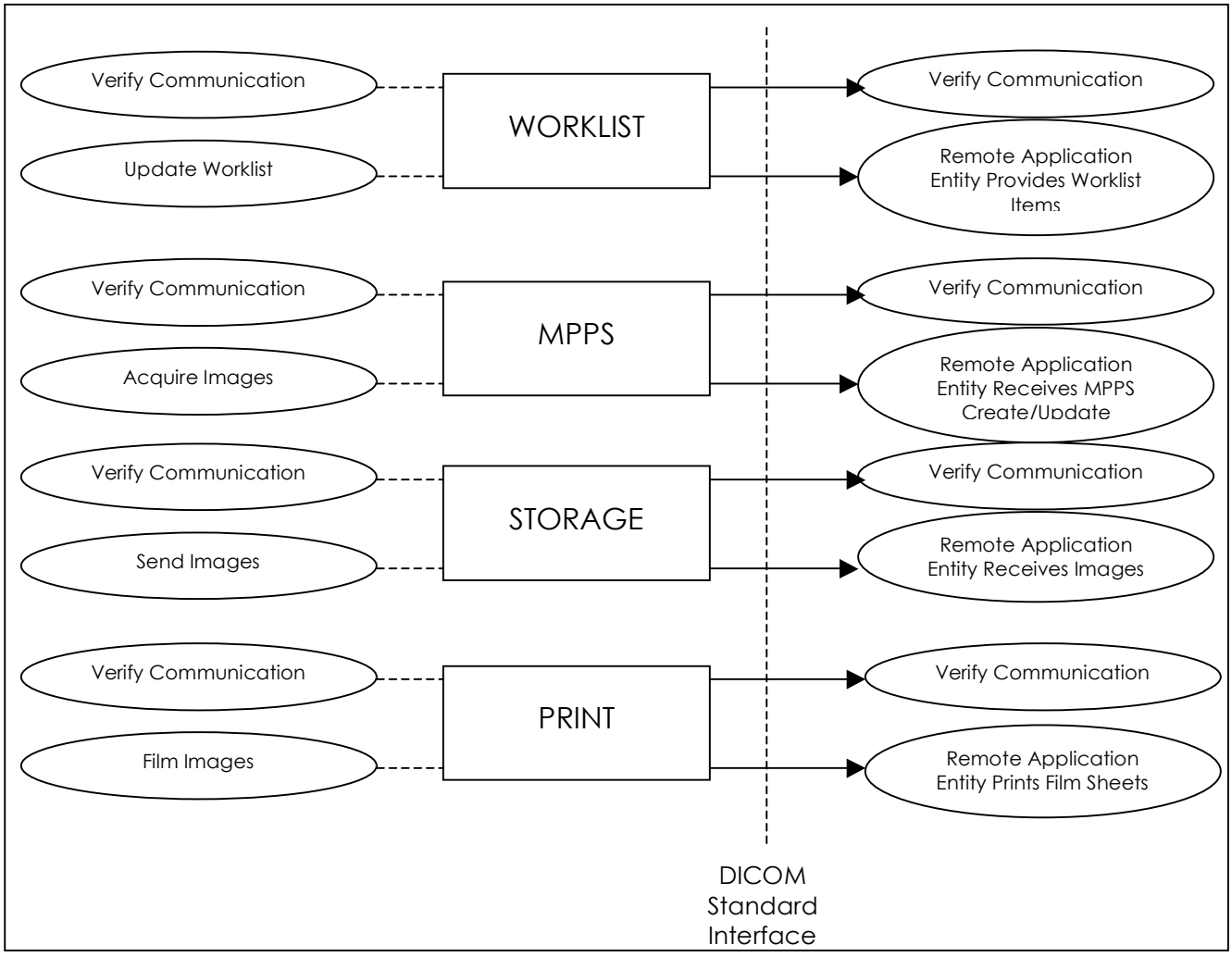


Figure 1. Zonare z.one — Implementation Model

2.1.2. Functional Definition of AE's

2.1.2.1. Functional Definition of the WORKLIST Application Entity

The WORKLIST AE acts as a user of the Modality Worklist Service Class so that it can obtain information regarding scheduled procedure steps including patient demographics. When the worklist page (located on the patient tab) is selected, a

pre-configured worklist query is submitted to the configured destination. A scheduled procedure step can be selected and its information is automatically used for the current exam.

Each time the worklist query is successfully performed, the results are cached by the local system. This enables a user to still locally query the cache to view a worklist when ZONARE z.one has been unplugged from the network while in portable mode.

2.1.2.2. Functional Definition of the MPPS Application Entity

The MPPS AE acts as a user of the Modality Performed Procedure Step SOP Class. This enables it to create and update Modality Performed Procedure Step SOP instances managed by a remote system. Acquisition of images results in automated creation of an MPPS Instance. Completion of the MPPS is performed as the result of the operator indicating the exam is complete by either selecting the "End Exam" button or starting a new exam.

ZONARE z.one supports queuing when the system is being used in portable mode and no network connection is available. Queuing functions independently of MPPS. As soon as a network connection can be established between the system and the remote host, all pending MPPS requests are processed in the background. Similarly, if the system is disconnected while there are pending MPPS requests, these requests are queued until the network connection is re-established.

2.1.2.3. Functional Definition of the STORAGE Application Entity

The STORAGE AE acts as a user of the Storage Service Class so that it can store ultrasound images on a remote system.

The user can store completed studies by selecting one or more in the Archive Utilities function.

Automated background image storage is also supported. ZONARE z.one can store the image as soon as the store key is pressed. ZONARE z.one can also store all images in an exam after the exam has been completed. ZONARE z.one may be configured to release associations after every image is stored or after all images in an exam have been stored.

ZONARE z.one supports queuing when the system is being used in portable mode and no network connection is available. Queuing functions independently of the storage method used. As soon as a network connection can be established between the system and the remote host, all pending storage requests are processed in the background. Similarly, if the system is disconnected while there are pending image storage requests, these requests are queued until the network connection is re-established.

2.1.2.4. Functional Definition of the PRINT Application Entity

The PRINT AE acts as a user of the Print Management Service Class so that it can print ultrasound images in either grayscale or color image film boxes.

The user can manually print completed studies by selecting one or more for printing in the Archive Utilities function.

Automated background print is also supported. ZONARE z.one prints the film as soon as the print key is pressed and the number of images in the layout has been met.

ZONARE z.one supports queuing when the system is being used in portable mode and no network connection is available. Queuing functions independently of the print method used. As soon as a network connection can be established between the system and the network printer, all pending print requests are processed in the background. Similarly, if the system is disconnected while there are pending image print requests, these requests are queued until the network connection is re-established.

2.1.3. Sequencing of Activities

All activities are initiated from the user interface. MPPS, STORAGE, and PRINT activities are enqueued to be performed asynchronously in the background while the WORKLIST activity is performed in the foreground. However, all activities are mutually exclusive to one another and are not dependent on any sequencing.

2.2. AE Specification

2.2.1. WORKLIST Application Entity Specification

2.2.1.1. SOP Classes

The WORKLIST AE provides Standard Conformance to the following SOP Classes:

Table 3. SOP Classes for Application Entity WORKLIST

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model — FIND	1.2.840.10008.5.1.4.31	Yes	No

2.2.1.2. Association Establishment Policies

2.2.1.2.1. General

The Modality Worklist AE recognizes the following Application Context Names:

Table 4. Application Context for AE WORKLIST

Standard DICOM Application Context Name	1.2.840.10008.3.1.1.1

The maximum PDU size that is advertised by the Modality Worklist AE during association-negotiation is configurable. The Modality Worklist AE has no internal limits regarding PDU sizes. It can advertise the value zero (0) which indicates that the Calling AE may send PDUs of any length (i.e. no maximum length).

Table 5. Maximum PDU Size Received for AE WORKLIST

Maximum PDU size received	Configurable

2.2.1.2.2. Number of Associations

The WORKLIST AE supports one simultaneous association.

Table 6. Number of Associations Initiated for AE WORKLIST

Maximum number of simultaneous associations	1

2.2.1.2.3. Asynchronous Nature

The WORKLIST AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 7. Asynchronous Nature as a SCU for AE WORKLIST

Maximum number of outstanding asynchronous transactions	1

2.2.1.2.4. Implementation Identifying Information

The WORKLIST AE provides the following implementation identifying information:

Table 8. Implementation Identifying Information for AE WORKLIST

Implementation Class UID	1.3.6.1.4.1.6052
Implementation Version Name Note: *number* represents a number of manufacture.	ZONARE_*number*

2.2.1.3. Association Initiation Policy

The WORKLIST AE only initiates an association under the following activities:

- Verify Communication with a Source Application
- Remote Application Entity Provides Worklist Items

2.2.1.3.1. Activity — Verify Communication with a Source Application

2.2.1.3.1.1 Description and Sequencing of Activities

In this real-world activity, the user initiates verification of communication with a source DICOM Application. The user does this by selecting a source DICOM Application and selecting a button labeled “Verify” on the Configuration Window. A dialog box appears displaying the results.

2.2.1.3.1.2 Proposed Presentation Contexts

The WORKLIST AE will propose the following presentation context items:

Table 9. Proposed Presentation Contexts, Verify Communication for AE WORKLIST

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Verification SOP class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Modality Worklist Information Model — FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

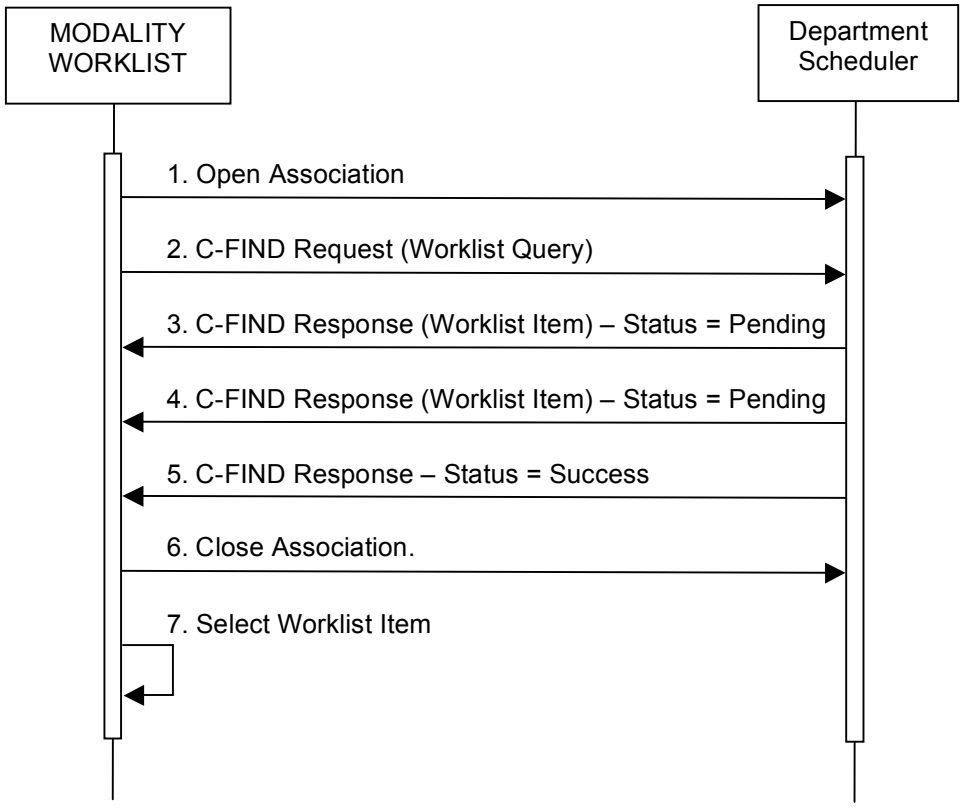
2.2.1.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

2.2.1.3.2. Activity — Remote Application Entity Provides Worklist Items

2.2.1.3.2.1 Description and Sequencing of Activities

The WORKLIST AE will initiate associations in order to query for images and other composite SOP Instances that are managed by the destination.


MODALITY WORKLIST
Department Scheduler
1. Open Association
2. C-FIND Request (Worklist Query)
3. C-FIND Response (Worklist Item) – Status = Pending
4. C-FIND Response (Worklist Item) – Status = Pending
5. C-FIND Response – Status = Success
6. Close Association.
7. Select Worklist Item

A possible sequence of interactions between the WORKLIST AE and an Department Scheduler is illustrated above:

1. A button labeled “Worklist” is selected on the Patient Information form.
2. The WORKLIST AE opens an association with the Department Scheduler.
3. The WORKLIST AE sends a C-FIND request to the Department Scheduler containing the Worklist Query attributes

4. The Departmental Scheduler returns a C-FIND response containing the requested attributes of the first matching Worklist Item.
5. The Departmental Scheduler returns another C-FIND response containing the requested attributes of the second matching Worklist Item.
6. The Departmental Scheduler returns another C-FIND response with status Success indicating that no further matching Worklist Items exist. This example assumes that only two Worklist items match the Worklist Query.
7. The user selects a Worklist Item from the Worklist and prepares to acquire new images.

2.2.1.3.2.2 Proposed Presentation Contexts

The WORKLIST AE will propose the following presentation context item:

Table 10. Proposed Presentation Contexts, Query Images for AE WORKLIST

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Modality Worklist Information Model — FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.3.2.2.1 Extended Negotiation

No extended negotiation is performed, and hence the WORKLIST AE does not invoke relational queries.

2.2.1.3.2.3 SOP Specific Conformance

2.2.1.3.2.3.1 SOP Specific Conformance to the Patient Root Query/Retrieve Information Model — FIND

The behavior of WORKLIST, when encountering status codes in a Modality Worklist C-FIND response, is summarized in the Table below. If any other SCP response status than "Success" or "Pending" is received by WORKLIST, a message “query failed” will appear on the user interface.

Table 11. Modality Worklist C-FIND Response Status Handling Behavior for AE WORKLIST

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The SCP has completed the matches. Worklist items are available for display or further processing.
Refused	Out of Resources	A700	
Failed	Identifier does not match SOP Class	A900	

Failed	Unable to Process	C000-CFFF	
Pending	Matches are continuing	FF00	The worklist item contained in the Identifier is collected for later display or further processing.
Pending	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	The worklist item contained in the Identifier is collected for later display or further processing.
*	*	Any other status code	

The behavior of WORKLIST during communication failure is summarized in the table below.

Table 12. Modality Worklist Communication Failure Behavior for AE WORKLIST

Exception	**Behavior**
Timeout	The association is aborted using A-ABORT and the worklist query marked as failed.
Association aborted by the SCP or network layers	The worklist query is marked as failed.

Acquired images will always use the Study Instance UID specified for the Scheduled Procedure Step (if available). If an acquisition is unscheduled, a Study Instance UID will be generated locally.

The Table below provides a description of the WORKLIST Worklist Request Identifier and specifies the attributes that are copied into the images. Unexpected attributes returned in a C-FIND response are ignored.

Requested return attributes not supported by the SCP are set to have no value. Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored. No attempt is made it filter out possible duplicate entries.

Table 13. Worklist Request Identifier for a Patient-Based Worklist Query

Module Name **Attribute Name**	**Tag**	**VR**	**M**	**R**	**D**	**IOD**
SOP Common Specific Character Set	(0008,0005)	CS		x		x
Scheduled Procedure Step Scheduled Procedure Step Sequence > Scheduled Station AE Title	(0040,0100) (0040,0001)	SQ AE		x	x	

> Scheduled Procedure Step Start Date	(0040,0002)	DA		x	x	
> Scheduled Procedure Step Start Time	(0040,0003)	TM		x	x	
> Modality	(0008,0060)	CS		x	x	x
> Scheduled Performing Physician's Name	(0040,0006)	PN		x		
> Scheduled Procedure Step Description	(0040,0007)	LO		x	x	x
> Scheduled Station Name	(0040,0010)	SH		x		
> Scheduled Procedure Step Location	(0040,0011)	SH		x		
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		x		x
> Scheduled Procedure Step ID	(0040,0009)	SH		x		x
> Schedlued Procedure Step Status	(0040,0020)	CS		x		
Requested Procedure						
Requested Procedure ID	(0040,1001)	SH	(S)	x	x	x
Requested Procedure Description	(0032,1060)	LO		x	x	x
Requested Procedure Code Sequence	(0032,1064)	SQ		x		x
Study Instance UID	(0020,000D)	UI		x		x
Referenced Study Sequence	(0008,1110)	SQ		x		x
Requested Procedure Priority	(0040,1003)	SH		x		
Names of Intended Recipients of Results	(0040,1010)	PN		x		
Imaging Service Request						
Accession Number	(0008,0050)	SH	(S)	x	x	x
Requesting Physician	(0032,1032)	PN		x		
Referring Physician's Name	(0008,0090)	PN		x	x	x
Placer Order Number/Imaging Service Request	(0040,2016)	LO		x		x
Filler Order Number/Imaging Service Request	(0040,2017)	LO		x		x
Visit Identification						
Admission ID	(0038,0010)	LO		x		x
Issuer of Admission ID	(0038,0011)	LO		x		x
Visit Relationship						
Referenced Patient Sequence	(0008,1120)	SQ		x		x
Visit Admission						
Admitting Diagnoses Description	(0008,1080)	LO		x		x
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		x		x
Patient Identification						
Patient's Name	(0010,0010)	PN	(S)	x	x	x
Patient ID	(0010,0020)	LO	(S)	x	x	x
Issuer of Patient ID	(0010,0021)	LO		x		x
Other Patient IDs	(0010,1000)	LO		x		x
Other Patient Names	(0010,1001)	PN		x		x
Patient Demographic						
Occupation	(0010,2180)	SH		x		x
Patient's Birth Date	(0010,0030)	DA		x	x	x
Patient's Birth Time	(0010,0032)	TM		x		x
Patient's Sex	(0010,0040)	CS		x	x	x
Patient's Size	(0010,1020)	DS		x		x
Patient's Weight	(0010,1030)	DS		x		x

Patient's Address	(0010,1040)	LO		x		x
Ethnic Group	(0010,2160)	SH		x		x
Patient Comments	(0010,4000)	LT		x	x	x
Patient Medical						
Additional Patient History	(0010,21B0)	LT		x		x

Table 14. Worklist Request Identifier for a Broad Worklist Query

Module Name Attribute Name	Tag	VR	M	R	D	IOD
SOP Common						
Specific Character Set	(0008,0005)	CS		x		x
Scheduled Procedure Step						
Scheduled Procedure Step Sequence	(0040,0100)	SQ				
> Scheduled Station AE Title	(0040,0001)	AE	(S)		x	
> Scheduled Procedure Step Start Date	(0040,0002)	DA	R		x	
> Scheduled Procedure Step Start Time	(0040,0003)	TM	R		x	
> Modality	(0008,0060)	CS	(S)		x	x
> Scheduled Performing Physician's Name	(0040,0006)	PN		x		
> Scheduled Procedure Step Description	(0040,0007)	LO		x	x	x
> Scheduled Station Name	(0040,0010)	SH		x		
> Scheduled Procedure Step Location	(0040,0011)	SH		x		
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		x		x
> Scheduled Procedure Step ID	(0040,0009)	SH		x		x
> Schedlued Procedure Step Status	(0040,0020)	CS		x		
Requested Procedure						
Requested Procedure ID	(0040,1001)	SH		x	x	x
Requested Procedure Description	(0032,1060)	LO		x	x	x
Requested Procedure Code Sequence	(0032,1064)	SQ		x		x
Study Instance UID	(0020,000D)	UI		x		x
Referenced Study Sequence	(0008,1110)	SQ		x		x
Requested Procedure Priority	(0040,1003)	SH		x		
Names of Intended Recipients of Results	(0040,1010)	PN		x		
Imaging Service Request						
Accession Number	(0008,0050)	SH		x	x	x
Requesting Physician	(0032,1032)	PN		x		
Referring Physician's Name	(0008,0090)	PN		x	x	x
Placer Order Number/Imaging Service Request	(0040,2016)	LO		x		x
Filler Order Number/Imaging Service Request	(0040,2017)	LO		x		x
Visit Identification						
Admission ID	(0038,0010)	LO		x		x
Issuer of Admission ID	(0038,0011)	LO		x		x
Visit Relationship						
Referenced Patient Sequence	(0008,1120)	SQ		x		x

Visit Admission						
Admitting Diagnoses Description	(0008,1080)	LO		x		x
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		x		x
Patient Identification						
Patient's Name	(0010,0010)	PN		x	x	x
Patient ID	(0010,0020)	LO		x	x	x
Issuer of Patient ID	(0010,0021)	LO		x		x
Other Patient IDs	(0010,1000)	LO		x		x
Other Patient Names	(0010,1001)	PN		x		x
Patient Demographic						
Occupation	(0010,2180)	SH		x		x
Patient's Birth Date	(0010,0030)	DA		x	x	x
Patient's Birth Time	(0010,0032)	TM		x		x
Patient's Sex	(0010,0040)	CS		x	x	x
Patient's Size	(0010,1020)	DS		x		x
Patient's Weight	(0010,1030)	DS		x		x
Patient's Address	(0010,1040)	LO		x		x
Ethnic Group	(0010,2160)	SH		x		x
Patient Comments	(0010,4000)	LT		x	x	x
Patient Medical						
Additional Patient History	(0010,21B0)	LT		x		x

The above table should be read as follows:

Module Name:	The name of the associated module for supported worklist attributes.
Attribute Name:	Attributes supported to build a WORKLIST AE Worklist Request Identifier.
Tag:	DICOM tag for this attribute.
VR:	DICOM VR for this attribute.
M:	Matching keys for (automatic) Worklist Query. A "S" will indicate that WORKLIST AE will supply an attribute value for Single Value Matching, a "R" will indicate Range Matching and a "*" will denote wildcard matching. It can be configured if "Scheduled Station AE Title" is additionally supplied "(S)" and if Modality is set to US.
R:	Return keys. An "x" will indicate that WORKLIST AE will supply this attribute as Return Key with zero length for Universal Matching.
D:	Displayed keys. An "x" indicates that this worklist attribute is displayed to the user during a patient registration dialog. For example, Patient Name will be displayed when registering the patient prior to an

examination.

IOD: An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step.

The default Query Configuration is set to “Modality” (US) and “Date” (date of today). Optionally, additional matching for the Scheduled Station AE Title is configurable.

2.2.2. MPPS Application Entity Specification

2.2.2.1. SOP Classes

The MPPS AE provides Standard Conformance to the following SOP Classes:

Table 15. SOP Classes for Application Entity MPPS

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes	No

2.2.2.2. Association Establishment Policies

2.2.2.2.1. General

The MPPS AE recognizes the following Application Context Names:

Table 16. Application Context for AE MPPS

Standard DICOM Application Context Name	1.2.840.10008.3.1.1.1

The maximum PDU size that is advertised by the MPPS AE during association-negotiation is configurable. The MPPS AE has no internal limits regarding PDU sizes. It can advertise the value zero (0) which indicates that the Calling AE may send PDUs of any length (i.e. no maximum length).

Table 17. Maximum PDU Size Received for AE MPPS

Maximum PDU size received	Configurable

2.2.2.2.2. Number of Associations

The MPPS AE supports one simultaneous association.

Table 18. Number of Associations Initiated for AE MPPS

Maximum number of simultaneous associations	1

2.2.2.2.3. Asynchronous Nature

The MPPS AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 19. Asynchronous Nature as a SCU for AE MPPS

Maximum number of outstanding asynchronous transactions	1

2.2.2.2.4. Implementation Identifying Information

The MPPS AE provides the following implementation identifying information:

Table 20. Implementation Identifying Information for AE MPPS

Implementation Class UID	1.3.6.1.4.1.6052
Implementation Version Name Note: *number* represents a number of manufacture.	ZONARE_*number*

2.2.2.3. Association Initiation Policy

The MPPS AE only initiates an association under the following activities:

- Verify Communication with a Source Application
- Remote Application Entity Receives MPPS Create/Update

2.2.2.3.1. Activity — Verify Communication with a Source Application

2.2.2.3.1.1 Description and Sequencing of Activities

In this real-world activity, the user initiates verification of communication with a source DICOM Application. The user does this by selecting a source DICOM Application and selecting a button labeled “Verify” on the Configuration Window. A dialog box appears displaying the results.

2.2.2.3.1.2 Proposed Presentation Contexts

The MPPS AE will propose the following presentation context items:

Table 21. Proposed Presentation Contexts, Verify Communication for AE MPPS

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

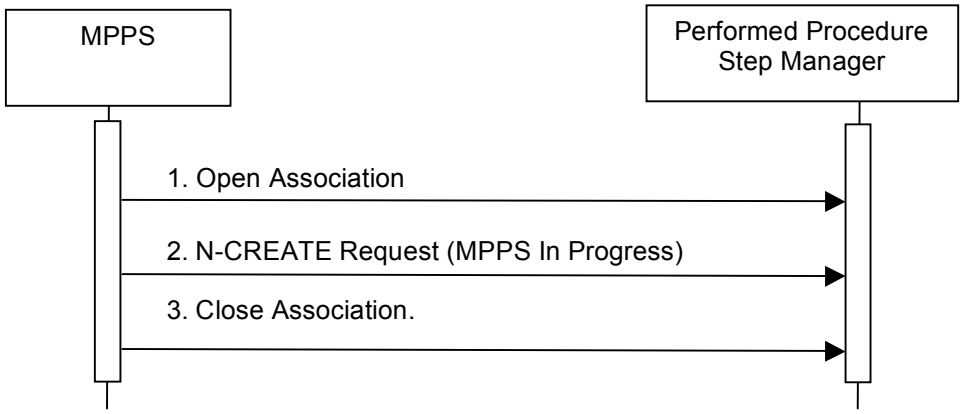
2.2.2.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

2.2.2.3.2. Activity — Remote Application Entity Receives MPPS Create/Update

2.2.2.3.2.1 Description and Sequencing of Activities

The MPPS AE will initiate associations in order to create and update Modality Performed Procedure Step SOP Instances that are managed by the remote destination.



A possible sequence of interactions between the MPPS AE and a Performed Procedure Step Manager is illustrated above:

1. The MPPS AE opens a new association with the Performed Procedure Step Manager.
2. The MPPS AE sends an N-CREATE request notifying the Performed Procedure Step Manager to create a Modality Performed Procedure Step SOP Instance. The Performed Procedure Step Manager replies with an N-CREATE response confirming the operation.
3. The MPPS AE closes the association with the Performed Procedure Step Manager.

2.2.2.3.2.2 Proposed Presentation Contexts

The MPPS AE will propose the following presentation context item:

Table 22. Proposed Presentation Contexts, Remote Application Entity Receives MPPS Create/Update for AE MPPS

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.2.3.2.2.1 Extended Negotiation

No extended negotiation is performed, and hence the MPPS AE does not invoke relational queries.

2.2.2.3.2.3 SOP Specific Conformance

2.2.2.3.2.3.1 SOP Specific Conformance to the Modality Performed Procedure Step SOP Class

The behavior of MPPS, when encountering status codes in a Modality Performed Procedure Step N-CREATE or N-SET response, is summarized in the Table below.

Table 23. MPPS N-CREATE/N-SET Response Status Handling Behavior for AE MPPS

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Failed	Processing Failure – Performed Procedure Step Object may no longer be updated	0110	The Association is aborted using A-ABORT and the MPPS is marked as failed. The status meaning is logged and reported to the user. Additional information in the response will be logged (i.e. Error Comment and Error ID).
Warning	Attribute Value Out of Range	0116	The MPPS operation is considered successful but the status meaning is logged. Additional information in the response identifying the attributes out of range will be logged (i.e. Elements in the Modification List/Attribute List).
*	*	Any other status code	The Association is aborted using A-ABORT and the MPPS is marked as failed. The status meaning is logged and reported to the user.

The behavior of MPPS during communication failure is summarized in the table below.

Table 24. MPPS Communication Failure Behavior for AE MPPS

Exception	Behavior
Timeout	The association is aborted using A-ABORT and the MPPS is marked as failed.
Association aborted by the SCP or network layers	The MPPS is marked as failed.

The following table provides a description of the MPPS N-CREATE and N-SET request identifiers sent by AE MPPS. Empty cells in the N-CREATE and N-SET columns indicate that the attribute is not sent. An “x” indicates that an appropriate value will be sent. A “Zero length” attribute will be sent with zero length.

Table 25. MPPS N-CREATE/N-SET Request Identifier for AE MPPS

Attribute Name	Tag	VR	N-CREATE	N-SET
Specific Character Set	(0008,0005)	CS	From Modality Worklist or configuration ("ISO_IR 100" if international characters enabled otherwise attribute is not sent).	
Modality	(0008,0060)	CS	US	
Procedure Code Sequence	(0008,1032)	SQ	From Modality Worklist (Requested Procedure Code Sequence)	
Referenced Patient Sequence	(0008,1120)	SQ	From Modality Worklist	
Patient's Name	(0010,0010)	PN	From Modality Worklist or user input. The user can modify values provided via Modality Worklist	
Patient ID	(0010,0020)	LO	From Modality Worklist or user input. The user can modify values provided via Modality Worklist	
Issuer of Patient ID	(0010,0021)	LO	From Modality Worklist	
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input. The user can modify values provided via Modality Worklist	
Patient's Sex	(0010,0040)	CS	From Modality Worklist or user input. The user can modify values provided via Modality Worklist	

Study ID	(0020,0010)	SH	From Modality Worklist (Requested Procedure ID) or generated by device[1]	
Admission ID	(0038,0010)	LO	From Modality Worklist	
Issuer of Admission ID	(0038,0011)	LO	From Modality Worklist	
Performed Station AE Title	(0040,0241)	AE	MPPS AE Title	
Performed Station Name	(0040,0242)	SH	From configuration	
Performed Location	(0040,0243)	SH	Zero length	
Performed Procedure Step Start Date	(0040,0244)	DA	Actual start date	
Performed Procedure Step Start Time	(0040,0245)	TM	Actual start time	
Performed Procedure Step End Date	(0040,0250)	DA	Zero length	Actual end date
Performed Procedure Step End Time	(0040,0251)	TM	Zero length	Actual end time
Performed Procedure Step Status	(0040,0252)	CS	IN PROGRESS	COMPLETED
Performed Procedure Step ID	(0040,0253)	SH	Generated by device	
Performed Procedure Step Description	(0040,0254)	LO	Zero length	Zero length
Performed Procedure Type Description	(0040,0255)	LO	Zero length	Zero length
Performed Protocol Code Sequence	(0040,0260)	SQ	Zero length	Zero length
Scheduled Step Attributes Sequence	(0040,0270)	SQ	One or more items	
> Accesson Number	(0008,0050)	SH	From Modality Worklist or user input. The user can modify values provided via	

[1] See recommendation from IHE Radiology Technical Framework, Volume II, Appendix A. Revision 5.x: IHE-5. Revision 6.0: Study ID in Tables A.1-x.

			Modality Worklist	
> Referenced Study Sequence	(0008,1110)	SQ	From Modality Worklist	
> Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated by device	
> Requested Procedure Description	(0032,1060)	LO	From Modality Worklist	
> Scheduled Procedure Step Description	(0040,0007)	LO	From Modality Worklist	
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	From Modality Worklist	
> Scheduled Procedure Step ID	(0040,0009)	SH	From Modality Worklist	
> Requested Procedure ID	(0040,1001)	SH	From Modality Worklist	
> Placer Order Number/Imaging Service Request	(0040,2016)	LO	From Modality Worklist	
> Filler Order Number/Imaging Service Request	(0040,2017)	LO	From Modality Worklist	
Comments on the Performed Procedure Step	(0040,0280)	ST	Zero length	Zero length
Performed Series Sequence	(0040,0340)	SQ	One item	One item
> Retrieve AE Title	(0008,0054)	AE	Zero length	Zero length
> Series Description	(0008,103E)	LO	x	x
> Performing Physician's Name	(0008,1050)	PN	Zero length	Zero length
> Operator's Name	(0008,1070)	PN	x	x
> Referenced Image Sequence	(0008,1140)	SQ	One or more items	One or more items
>> Referenced SOP Class UID	(0008,1150)	UI	x	x
>> Referenced SOP Instance UID	(0008,1155)	UI	x	x
> Protocol Name	(0018,1030)	LO	x	x
> Series Instance UID	(0020,000E)	UI	x	x

> Referenced Standalone SOP Instance Sequence	(0040,0220)	SQ	Zero length (SOP classes not supported)	Zero length (SOP classes not supported)
Film Consumption Sequence	(0040,0321)	SQ	Zero or more items	Zero or more items
> Number of Films	(2100,0170)	IS	x	x
> Medium Type	(2000,0030)	CS	x	x
> Film Size ID	(2010,0050)	CS	x	x

2.2.3. STORAGE Application Entity Specification

2.2.3.1. SOP Classes

The STORAGE AE provides Standard Conformance to the following SOP Classes:

Table 26. SOP Classes for Application Entity STORAGE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No

2.2.3.2. Association Establishment Policies

2.2.3.2.1. General

The STORAGE AE recognizes the following Application Context Names:

Table 27. Application Context for AE STORAGE

Standard DICOM Application Context Name	1.2.840.10008.3.1.1.1

The maximum PDU size that is advertised by the STORAGE AE during association-negotiation is configurable. The STORAGE AE has no internal limits regarding PDU sizes. It can advertise the value zero (0) which indicates that the Calling AE may send PDUs of any length (i.e. no maximum length).

Table 28. Maximum PDU Size Received for AE STORAGE

Maximum PDU size received	Configurable

2.2.3.2.2. Number of Associations

The STORAGE AE supports one simultaneous association.

Table 29. Number of Associations Initiated for AE STORAGE

Maximum number of simultaneous associations	1

2.2.3.2.3. Asynchronous Nature

The STORAGE AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 30. Asynchronous Nature as a SCU for AE STORAGE

Maximum number of outstanding asynchronous transactions	1

2.2.3.2.4. Implementation Identifying Information

The Storage AE provides the following implementation identifying information:

Table 31. Implementation Identifying Information for AE STORAGE

Implementation Class UID	1.3.6.1.4.1.6052
Implementation Version Name Note: *number* represents a number of manufacture.	ZONARE_*number*

2.2.3.3. Association Initiation Policy

The STORAGE AE initiates an association under the following activities:

- Verify Communication
- Send Storage Request

2.2.3.3.1. Activity — Verify Communication

2.2.3.3.1.1 Description and Sequencing of Activities

In this activity, the STORAGE AE is processing a user-request to verify communication with a DICOM Application Entity that is registered for the purposes of Ultrasound Image Storage. The user selects a destination from the network storage list, selects a button labeled “Edit Selected”, and then selects a button labeled “Verify”. A window appears displaying the results.

2.2.3.3.1.2 Proposed Presentation Contexts

The STORAGE AE will propose the following presentation contexts:

Table 32. Acceptable Presentation Contexts, Verify Communication for AE STORAGE

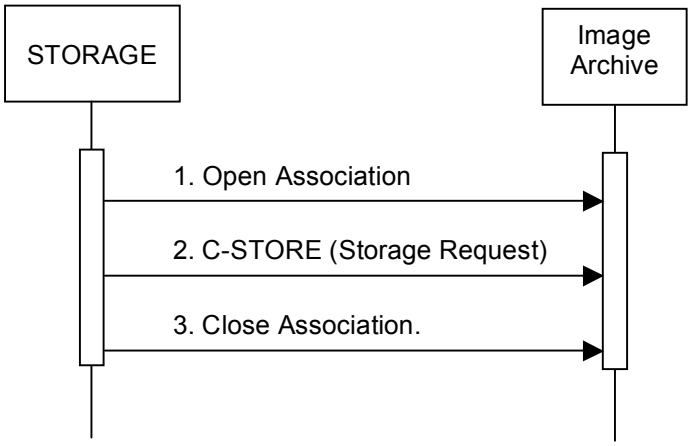
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.3.3.2. Activity — Send Storage Request

2.2.3.3.2.1 Description and Sequencing of Activities

The STORAGE AE will initiate associations in order to send images and other composite SOP Instances to the destination for storage.



A possible sequence of interactions between the STORAGE AE and an Image Archive is illustrated above:

1. The STORAGE AE opens a new association with the Image Archive.
2. The STORAGE AE sends a C-STORE request notifying the Image Archive to store an image or other composite SOP Instance. The Image Archive replies with a C-STORE response confirming storage.
3. The STORAGE AE closes the association with the Image Archive.

2.2.3.3.2.2 Proposed Presentation Contexts

The STORAGE AE proposes one or more presentation contexts whose abstract syntaxes correspond to the SOP Classes that are associated with the images. The STORAGE AE may propose more than one presentation context with the same abstract syntax in which case the set of transfer syntaxes are different in each presentation context. The particular number of presentation contexts with the same abstract syntax and the set of transfer syntaxes are dependent upon

configuration. However, the maximum set of presentation contexts that can be proposed are as follows:

Table 33. Proposed Presentation Contexts, Send Storage Request for AE STORAGE

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	**UID**			
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See referenced table.	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See referenced table.	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See referenced table.	SCU	None

Table 34. Proposed Transfer Syntaxes, Send Storage Request for AE STORAGE

Image Compression Type[1]	Transfer Syntax	
	Name	**Value**
None	Explicit VR Little Endian	1.2.840.10008.1.2.1
	Implicit VR Little Endian	1.2.840.10008.1.2
RLE Lossless	RLE Lossless	1.2.840.10008.1.2.5
	Explicit VR Little Endian	1.2.840.10008.1.2.1
	Implicit VR Little Endian	1.2.840.10008.1.2
JPEG Lossy	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
	Explicit VR Little Endian	1.2.840.10008.1.2.1
	Implicit VR Little Endian	1.2.840.10008.1.2

Notes: 1. The Image Compression Type is the type of compression that has been applied to the image and stored on media.

2. The order of transfer syntaxes that are proposed within a presentation context item is the order presented in this table.

2.2.3.3.2.2.1 Extended Negotiation

No extended negotiation is performed.

2.2.3.3.2.3 SOP Specific Conformance

2.2.3.3.2.3.1 SOP Specific Conformance for Storage SOP Classes

The behavior of the STORAGE AE when it encounters status codes in a C-STORE response is summarized below.

Table 35. Storage C-STORE Response Status Handling Behavior for AE STORAGE

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the SOP Instance. A record is added to the event

			log with a type equal to "information". The event log record includes the error code. If there are more SOP Instances to store, then the next SOP Instance is sent, otherwise the association is released.
Warning	Coercion of Data Elements	B000	SOP Instance transmission is considered successful. A record is added to the event log with a type equal to "warning". The event log record includes the error code. If there are more SOP Instances to store, then the next SOP Instance is sent, otherwise the association is released.
Warning	Data Set does not match SOP Class	B007	SOP Instance transmission is considered successful. A record is added to the event log with a type equal to "warning". The event log record includes the error code. If there are more SOP Instances to store, then the next SOP Instance is sent, otherwise the association is released.
Warning	Elements Discarded	B006	SOP Instance transmission is considered successful. A record is added to the event log with a type equal to "warning". The event log record includes the error code. If there are more SOP Instances to store, then the next SOP Instance is sent, otherwise the association is released.
*	*	Any other status code	SOP Instance transmission is considered unsuccessful. A record is added to the event log with a type equal to "error". The event log record includes the error code and any error comment. The failed SOP Instance may be re-

			enqueued for re-transmission in a subsequent association depending upon configuration and the number of previous attempts of transmission. If there are more SOP Instances to store, then the next SOP Instance is sent, otherwise the association is released.

The behavior of the STORAGE AE during communication failure is summarized below.

Table 36. Storage Communication Failure Behavior for AE STORAGE

Exception	**Behavior**
Timeout	The association is aborted. The transmission of the outstanding SOP Instance is considered unsuccessful. The failed SOP Instance may be re-enqueued for re-transmission in a subsequent association depending upon configuration and the number of previous attempts of transmission.
Association aborted by the SCP or network layers	The transmission of the outstanding SOP Instance is considered unsuccessful. The failed SOP Instance may be re-enqueued for re-transmission in a subsequent association depending upon configuration and the number of previous attempts of transmission.

2.2.3.4. Association Acceptance Policy

The STORAGE AE does not accept associations under any circumstances. The STORAGE AE does not listen for incoming transport connections.

2.2.4. PRINT Application Entity Specification

2.2.4.1. SOP Classes

The PRINT AE provides Standard Conformance to the following SOP Classes:

Table 37. SOP Classes for Application Entity PRINT

SOP Class Name	**SOP Class UID**	**SCU**	**SCP**
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Yes	No

2.2.4.2. Association Establishment Policies

2.2.4.2.1. General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 38. Application Context for AE PRINT

Standard DICOM Application Context Name	1.2.840.10008.3.1.1.1

The maximum PDU size that is advertised by the PRINT AE during association-negotiation is configurable. The PRINT AE has no internal limits regarding PDU sizes. It can advertise the value zero (0) which indicates that the Calling AE may send PDUs of any length (i.e. no maximum length).

Table 39. Maximum PDU Size Received for AE PRINT

Maximum PDU size received	Configurable

2.2.4.2.2. Number of Associations

The PRINT AE supports supports one simultaneous association.

Table 40. Number of Associations Initiated for AE PRINT

Maximum number of simultaneous associations	1

2.2.4.2.3. Asynchronous Nature

The PRINT AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 41. Asynchronous Nature as a SCU for AE PRINT

Maximum number of outstanding asynchronous transactions	1

2.2.4.2.4. Implementation Identifying Information

The Print AE provides the following implementation identifying information:

Table 42. Implementation Identifying Information for AE PRINT

Implementation Class UID	1.3.6.1.4.1.6052
Implementation Version Name Note: *number* represents a number of manufacture.	ZONARE_*number*

2.2.4.3. Association Initiation Policy

The PRINT AE initiates an association under the following activities:

- Verify Communication
- Send Print Request

2.2.4.3.1. Activity — Verify Communication

2.2.4.3.1.1 Description and Sequencing of Activities

In this activity, the PRINT AE is processing a user-request to verify communication with a DICOM Application Entity that is registered for the purposes of Print Management. The user selects a printer from the printer list, selects a button labeled “Edit Selected”, and then selects a button labeled “Verify”. A window appears displaying the results.

2.2.4.3.1.2 Proposed Presentation Contexts

The PRINT AE proposes the following presentation contexts when the Grayscale/Color parameter is set to “Grayscale”:

Table 43. Proposed Presentation Contexts, Verify Communication for AE PRINT, “Grayscale”

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

The PRINT AE proposes the following presentation contexts when the Grayscale/Color parameter is set to “Color”:

Table 44. Proposed Presentation Contexts, Verify Communication for AE PRINT, “Color”

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.4.3.2. Activity — Send Print Request

2.2.4.3.2.1 Description and Sequencing of Activities

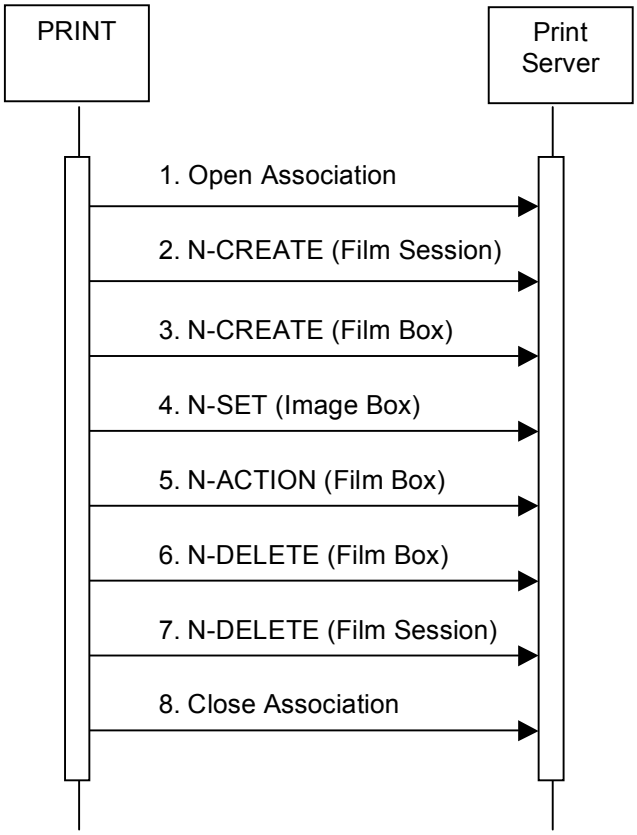
The PRINT AE will initiate associations in order to send pre-formatted images to the destination for printing.

Several DIMSE operations are invoked as outlined below:

Table 45. Print Management SCU Session, Send Print Request for AE PRINT

A-ASSOCIATE N-CREATE (Basic Film Session SOP Instance) for (each film of film session)

```
{
        N-CREATE (Basic Film Box SOP Instance)
        for (each image of film)
        {
                N-SET (Basic Grayscale/Color Image Box SOP Instance)
        }
        N-ACTION (PRINT, Basic Film Box SOP Instance)
        N-DELETE (Basic Film Box SOP Instance)
}
N-DELETE (Basic Film Session SOP Instance)
A-RELEASE
```



A possible sequence of interactions between the PRINT AE and a Print Server is illustrated above:

1. The PRINT AE opens a new association with the Print Server.
2. The PRINT AE sends an N-CREATE request notifying the Print Server to create a Film Session. The Print Server replies with an N-CREATE response confirming the creation.
3. The PRINT AE sends an N-CREATE request notifying the Print Server to create a Film Box. The Print Server replies with an N-CREATE response confirming the creation.

4. The PRINT AE sends an N-SET request notifying the Print Server to update an instance of the Image Box. The Print Server replies with an N-SET response confirming the update.
5. The PRINT AE sends an N-ACTION request notifying the Print Server to print the Film Box. The Print Server replies with an N-ACTION response confirming the print action.
6. The PRINT AE sends an N-DELETE request notifying the Print Server to destroy the Film Box. The Print Server replies with an N-CREATE response confirming its destruction
7. The PRINT AE sends an N-DELETE request notifying the Print Server to destroy the Film Session. The Print Server replies with an N-CREATE response confirming its destruction.
8. The PRINT AE closes the association with the Print Server.

2.2.4.3.2.2 Proposed Presentation Contexts

The PRINT AE proposes the following presentation contexts when the Grayscale/Color parameter is set to “Grayscale”:

Table 46. Proposed Presentation Contexts, Send Print Request for AE PRINT, “Grayscale”

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

The PRINT AE proposes the following presentation contexts contexts when the Grayscale/Color parameter is set to “Color”:

Table 47. Proposed Presentation Contexts, Send Print Request for AE PRINT, “Color”

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.4.3.2.2.1 Extended Negotiation

No extended negotiation is performed.

2.2.4.3.2.3 SOP Specific Conformance

2.2.4.3.2.3.1 Common SOP Specific Conformance for all Print Management SOP Classes

The following tables use a number of abbreviations. The abbreviations used in the "Presence of Value" column are:

ANAP	Attribute Not Always Present
ALWAYS	Attribute Always Present With Value

The abbreviations used in the "Source" column are:

CONFIG	The attribute value source is a configurable parameter.
USER	The attribute value source is from user input.
AUTO	The attribute value is set automatically.

The general behavior of the PRINT AE during communication failure is summarized below. This behavior is common for all SOP Classes supported by the PRINT AE.

Table 48. Communication Failure Behavior for AE PRINT

Exception	**Behavior**
Timeout	The association is aborted and the print-job is marked as failed. The reason is logged.
Association aborted by the SCP or network layers	The print-job is marked as failed. The reason is logged.

2.2.4.3.2.3.2 SOP Specific Conformance for the Film Session SOP Class

The PRINT AE supports the following DIMSE operations for the Film Session SOP Class:

- N-CREATE
- N-DELETE

2.2.4.3.2.3.2.1 Film Session SOP Class Operations (N-CREATE)

The attributes supplied in an N-CREATE request are listed below.

Table 49. Film Session SOP Class N-CREATE Request Attributes for AE PRINT

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Number of Copies	(2000, 0010)	IS	1† … 99	ALWAYS	CONFIG
Print Priority	(2000, 0020)	CS	One of the following: HIGH MED† LOW	ALWAYS	CONFIG
Medium Type	(2000, 0030)	CS	One of the following: PAPER CLEAR FILM BLUE FILM†	ALWAYS	CONFIG

Film Destination	(2000, 0040)	CS	PROCESSOR	ALWAYS	AUTO

The behavior of the PRINT AE when encountering status codes in an N-CREATE response is summarized below.

Table 50. Film Session SOP Class N-CREATE Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.2.2 Film Session SOP Class Operations (N-DELETE)

The behavior of the PRINT AE when encountering status codes in an N-DELETE response is summarized below.

Table 51. Film Session SOP Class N-DELETE Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.3 SOP Specific Conformance for the Film Box SOP Class

The PRINT AE supports the following DIMSE operations for the Film Box SOP Class:

- N-CREATE
- N-ACTION
- N-DELETE

2.2.4.3.2.3.3.1 Film Box SOP Class Operations (N-CREATE)

The attributes supplied in an N-CREATE request are listed below.

Table 52. Film Box SOP Class N-CREATE Request Attributes for AE PRINT

Attribute Name	Tag	VR	Value	Presence of Value	Source

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010, 0010)	CS	One of the following: STANDARD\1,1 STANDARD\1,2 STANDARD\2,1 STANDARD\2,2† STANDARD\2,3 STANDARD\3,2 STANDARD\3,3 STANDARD\3,4 STANDARD\3,5 STANDARD\4,3 STANDARD\4,4 STANDARD\4,5 STANDARD\4,6 STANDARD\5,4 STANDARD\5,5 STANDARD\5,6 STANDARD\5,7	ALWAYS	CONFIG
Referenced Film Session Sequence	(2010, 0500)	SQ	One item.	ALWAYS	AUTO
> Referenced SOP Class UID	(0008, 1150)	UI	1.2.840.10008.5.1.1.1	ALWAYS	AUTO
> Referenced SOP Instance UID	(0008, 1155)	UI	From created Film Session SOP Instance.	ALWAYS	AUTO
Film Orientation	(2010, 0040)	CS	One of the following: PORTRAIT† LANDSCAPE	ALWAYS	CONFIG
Film Size ID	(2010, 0050)	CS	One of the following: 8INX10IN† 85INX11IN 10INX12IN 10INX14IN 11INX14IN 11INX17IN 14INX14IN 14INX17IN 24CMX24CM 24CMX30CM A4 A3	ALWAYS	CONFIG
Magnification Type	(2010, 0060)	CS	One of the following: REPLICATE BILINEAR CUBIC† NONE	ALWAYS	CONFIG
Max Density	(2010, 0130)	US	1 ... 399	ANAP	CONFIG

Attribute Name	Tag	VR	Value	Presence of Value	Source
Smoothing Type	(2010, 0080)	CS	From configuration	ANAP	CONFIG
Border Density	(2010, 0100)	CS	One of the following: BLACK† WHITE 1 ... 399	ALWAYS	CONFIG
Empty Image Density	(2010, 0110)	CS	One of the following: BLACK† WHITE 1 ... 399	ALWAYS	CONFIG
Min Density	(2010, 0120)	US	1 ... 399	ANAP	CONFIG
Trim	(2010, 0140)	CS	One of the following: YES† NO	ALWAYS	CONFIG

The behavior of the PRINT AE when encountering status codes in an N-CREATE response is summarized below.

Table 53. Film Box SOP Class N-CREATE Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.3.2 Film Box SOP Class Operations (N-ACTION)

The behavior of the PRINT AE when encountering status codes in an N-ACTION response is summarized below.

Table 54. Film Box SOP Class N-ACTION Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.3.3 Film Box SOP Class Operations (N-DELETE)

The behavior of the PRINT AE when encountering status codes in an N-DELETE response is summarized below.

Table 55. Film Box SOP Class N-DELETE Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.4 SOP Specific Conformance for the Basic Grayscale Image Box SOP Class

The PRINT AE supports the following DIMSE operations for the Basic Grayscale Image Box SOP Class:

- N-SET

2.2.4.3.2.3.4.1 Basic Grayscale Image Box SOP Class Operations (N-SET)

The attributes supplied in an N-SET request are listed below.

Table 56. Basic Grayscale Image Box SOP Class N-SET Request Attributes for AE PRINT

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020, 0010)	US	Dependent upon Image Display Format and the order of the images in the Film Box.	ALWAYS	AUTO
Basic Grayscale Image Sequence	(2020, 0110)	SQ	One item.	ALWAYS	AUTO
> Samples Per Pixel	(0028, 0002)	US	1	ALWAYS	AUTO
> Photometric Interpretation	(0028, 0004)	CS	MONOCHROME2	ALWAYS	AUTO
> Rows	(0028, 0010)	US	480	ALWAYS	AUTO
> Columns	(0028, 0011)	US	640	ALWAYS	AUTO
> Pixel Aspect Ratio	(0028, 0034)	IS	1\1	ALWAYS	AUTO
> Bits Allocated	(0028, 0100)	US	8	ALWAYS	AUTO
> Bits Stored	(0028, 0101)	US	8	ALWAYS	AUTO
> High Bit	(0028, 0102)	US	7	ALWAYS	AUTO
> Pixel Representation	(0028, 0103)	US	0	ALWAYS	AUTO
> Pixel Data	(7FE0, 0010)	OB	Pixels of rendered film sheet.	ALWAYS	AUTO
Polarity	(2020, 0020)	CS	NORMAL	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Magnification Type	(2010, 0060)	CS	One of the following: REPLICATE BILINEAR CUBIC† NONE	ALWAYS	CONFIG
Smoothing Type	(2010, 0080)	CS	From configuration	ANAP	CONFIG

The behavior of the PRINT AE when encountering status codes in a N-SET response is summarized below.

Table 57. Basic Grayscale Image Box SOP Class N-SET Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Image successfully stored in Image Box.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.2.4.3.2.3.5 SOP Specific Conformance for the Basic Grayscale Image Box SOP Class

The PRINT AE supports the following DIMSE operations for the Basic Grayscale Image Box SOP Class:

- N-SET

2.2.4.3.2.3.5.1 Basic Color Image Box SOP Class Operations (N-SET)

The attributes supplied in an N-SET request are listed below.

Table 58. Basic Color Image Box SOP Class N-SET Request Attributes for AE PRINT

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020, 0010)	US	Dependent upon Image Display Format and the order of the images in the Film Box.	ALWAYS	AUTO
Basic Color Image Sequence	(2020, 0111)	SQ	One item.	ALWAYS	AUTO
> Samples Per Pixel	(0028, 0002)	US	3	ALWAYS	AUTO
> Photometric Interpretation	(0028, 0004)	CS	RGB	ALWAYS	AUTO
> Planar	(0028, 0006)	US	1	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Configuration					
> Rows	(0028, 0010)	US	480	ALWAYS	AUTO
> Columns	(0028, 0011)	US	640	ALWAYS	AUTO
> Pixel Aspect Ratio	(0028, 0034)	IS	1\1	ALWAYS	AUTO
> Bits Allocated	(0028, 0100)	US	8	ALWAYS	AUTO
> Bits Stored	(0028, 0101)	US	8	ALWAYS	AUTO
> High Bit	(0028, 0102)	US	7	ALWAYS	AUTO
> Pixel Representation	(0028, 0103)	US	0	ALWAYS	AUTO
> Pixel Data	(7FE0, 0010)	OB	Pixels of rendered film sheet.	ALWAYS	AUTO
Polarity	(2020, 0020)	CS	NORMAL	ALWAYS	AUTO
Magnification Type	(2010, 0060)	CS	One of the following: REPLICATE BILINEAR CUBIC NONE	ALWAYS	CONFIG
Smoothing Type	(2010, 0080)	CS	From configuration	ANAP	CONFIG

The behavior of the PRINT AE when encountering status codes in a N-SET response is summarized below.

Table 59. Basic Color Image Box SOP Class N-SET Response Status Handling Behavior for AE PRINT

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. Image successfully stored in Image Box.
*	*	Any other status code	The Association is released using AP-ABORT and the print-job is marked as failed. The status meaning is logged and reported to the user.

2.3. Network Interfaces

ZONARE z.one provides the DICOM V3.0 TCP/IP network communication support as defined in Part 8 of the DICOM Standard.

2.3.1. TCP/IP Stack

ZONARE z.one supports the TCP/IP protocol stack.

One IP address may be assigned to the ZONARE z.one either manually or automatically via DHCP (Dynamic Host Configuration Protocol).

When the IP address is assigned automatically via DHCP, the DHCP Parameter Request List option (code 55) is specified. This option contains the following parameters: Subnet Mask option (code 1), Router option (code 3), and the Domain Name Server option (code 6).

Note: DNS (Domain Name System) is not supported by the ZONARE z.one.

2.3.1.1. Physical Media Support

ZONARE z.one supports IEEE 802.3/802.3u – 100Base-TX/10Base-T with auto negotiation: 10 MBit / 100 MBit, full/half duplex.

2.4. Configuration

ZONARE z.one is a highly configurable product. This section highlights the parameters that are configurable. Details on the implementation and specification of these configuration parameters are provided in the "ZONARE z.one Service Manual".

2.4.1. AE Title/Presentation Address Mapping

The translation from AE Title to Presentation Address is primarily achieved using persistent configuration data that is accessible from the user interface: `Tools □ Sys Setup □ Dicom □ General`.

However certain default settings are present at the time of installation. These are:

Table 60. Default AE Title/Presentation Address Mapping

Application Entity	Role	Default AE Title	Default TCP/IP Port
WORKLIST	SCU	ZONARE	—
MPPS	SCU	ZONARE	—
STORAGE	SCU	ZONARE	—
PRINT	SCU	ZONARE	—

Note: The AE Title for all Application Entities, whether it is the default value or a user-modified value, is identical. That is, there is only one configurable parameter whose value is used as the AE Title for all Application Entities.

2.4.2. Configurable Parameters

Table 61. Configurable Parameters

Parameter	Configurable Yes/No	Default Value
General Parameters		
Maximum PDU Receive Size	Yes	16384 bytes
Maximum PDU Send Size	Yes	16384 bytes
Time-out waiting for an acceptance or rejection response to an Association Request.	No	

(Application Level timeout)		
Time-out waiting for a response to an Association release request. (Application Level timeout)	No	
Time-out waiting for completion of a TCP/IP connect request. (Application Level timeout)	Yes	30 seconds
Time-out waiting a response to a DIMSE Request (Low-level timeout)	No	
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	
Storage Parameters		
Storage SCU time-out waiting for a response to a C-STORE-RQ	Yes	30 seconds
Delay between retrying failed send jobs.	Yes	120 seconds
Maximum number of simultaneously initiated Associations by the Storage AE	No	1
Supported Transfer Syntaxes (seperately configurable for each remote AE)	Yes	Implicit VR Little Endian
Modality Worklist Parameters		
Modality Worklist SCU time-out waiting for the final response to a C-FIND-RQ	Yes	30 seconds
Maximum number of Worklist Items Cached	Yes	200
Supported Transfer Syntaxes for Modality Worklist	No	Implicit VR Little Endian
Delay between automatic Worklist Updates	Yes	30 minutes
Query Worklist for specific Scheduled Station AE Title	Yes	
Query Worklist for specific Modality value	Yes	US
Modality Performed Procedure Step Parameters		
MPPS SCU time-out waiting for a response to a N-CREATE-RQ	Yes	30 seconds
MPPS SCU time-out waiting for a response to a N-SET-RQ	Yes	30 seconds
Supported Transfer Syntaxes for MPPS	No	Implicit VR Little Endian
Print Parameters		
Print SCU time-out waiting for a response to a N-CREATE-RQ	Yes	30 seconds

Print SCU time-out waiting for a response to a N-SET-RQ	Yes	30 seconds
Print SCU time-out waiting for a response to a N-ACTION-RQ	Yes	30 seconds
Print SCU time-out waiting for a response to a N-DELETE-RQ	Yes	30 seconds
Supported Transfer Syntaxes (separately configurable for each remote printer)	No	Implicit VR Little Endian
Number of times a failed print-job may be retried	No	Infinite without user intervention.
Delay between retrying failed print-jobs	Yes	120 seconds
Printer correction LUT (separately configurable for each remote printer)	No	

Section 3. Media Interchange

3.1. Implementation Model

3.1.1. Application Data Flow Diagram

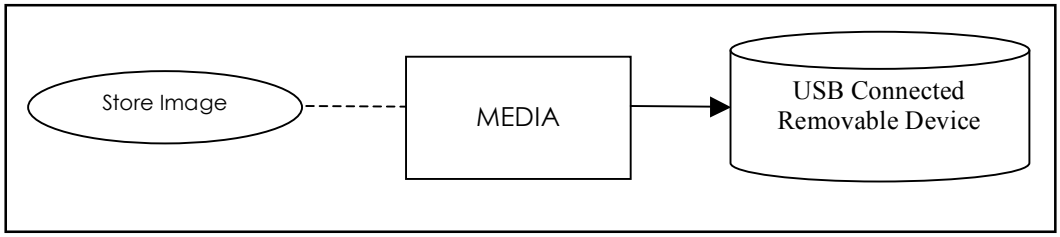


Figure 1. ZONARE z.one — Application Data Flow Diagram for Media

3.1.2. Functional Definition of AE's

3.1.2.1. Functional Definition of the MEDIA Application Entity

The MEDIA AE performs the following functions:

- File-set creator (FSC): MEDIA AE initializes Media by acting as a FSC to create a new DICOM File-set on a USB connected removable device which uses an unpartitioned FAT16 or FAT32 file system.
- File-set updater (FSU): MEDIA AE updates the DICOMDIR file and adds or removes DICOM files when the user exports or deletes studies/images.
- File-set reader (FSR): MEDIA AE reads the DICOMDIR and generates a listing of the studies on the media for importing.

3.1.3. Sequencing of Real World Activities

No sequencing of activities is necessary.

3.1.4. File Meta Information for Implementation Class and Version

The implementation information written to the File Meta Header in each file is:

Table 62. Implementation Identifying Information for AE MEDIA

Implementation Class UID	1.3.6.1.4.1.6052
Implementation Version Name Note: *number* represents a number of manufacture.	ZONARE_*number*

3.2. AE Specifications

3.2.1. MEDIA Application Entity Specification

The MEDIA Application Entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed below:

Table 63. Application Profiles, Activities and Roles for MEDIA AE

Application Profiles Supported	Real World Activity	Role	SC Option
ZONARE-USB (private)	Export to USB Connected Removable Device	FSC	Interchange
ZONARE- USB (private)	Import from USB Connected Removable Device	FSR	Interchange

3.2.1.1. File Meta Information for the Application Entity

The Source Application Entity Title included in the File Meta Header is configurable (see section 3.4).

The first eight bytes of the preamble are encoded as an image file header according to the TIFF, Tag Image File Format, Revision 6.0 specification with a little endian byte order. All TIFF Image File Directory entries are located in the attribute Data Set Trailing Padding (FFFC, FFFC).

3.2.1.2. Real-World Activities

3.2.1.2.1. Activity – Export to USB Connected Removable Device

The MEDIA Application Entity acts as an FSC or FSU using the interchange option when requested to export images to a USB Connected Removable Device.

3.2.1.2.1.1 Media Storage Application Profiles

The MEDIA Application Entity supports the ZONARE-USB private Application Profile.

3.2.1.2.1.1.1 Options

The MEDIA Application Entity supports the SOP Classes and Transfer Syntaxes listed in the Table below:

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	RLE Lossless	1.2.840.10008.1.2.5
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	RLE Lossless	1.2.840.10008.1.2.5

3.2.1.2.2. Activity – Import from USB Connected Removable Device

The MEDIA Application Entity acts as an FSR using the interchange option when requested to import images from a USB Connected Removable Device.

3.2.1.2.2.1 Media Storage Application Profiles

The MEDIA Application Entity supports the ZONARE-USB private Application Profile.

3.2.1.2.2.1.1 Options

The MEDIA Application Entity supports the SOP Classes and Transfer Syntaxes listed in the Table below:

Information Object Definition	**SOP Class UID**	**Transfer Syntax**	**Transfer Syntax UID**
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	RLE Lossless	1.2.840.10008.1.2.5
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	RLE Lossless	1.2.840.10008.1.2.5
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7	RLE Lossless	1.2.840.10008.1.2.5

Storage			

3.3. Augmented and Private Application Profiles

MEDIA AE supports the ZONARE-USB private application profile.

3.3.1. Private Application Profiles

3.3.1.1. ZONARE Private Application Profile

3.3.1.1.1. Class and Profile Identification

This section defines an Application Profile Class for the ZONARE z.one ultrasound clinical application. This class is intended to be used for the interchange of Ultrasound Image Storage SOP Instances via USB Connected Removable Devices for the ZONARE z.one ultrasound clinical application. Images may be compressed without loss using RLE or with loss using JPEG Baseline (Process 1); all readers shall support compression.

The specific application profiles are shown in the following table.

Table 64. Application Profiles

Application Profile	Identifier	Description
ZONARE USB Interchange	ZONARE-USB	Handles interchange of Ultrasound Image Storage SOP Instances optionally compressed with lossless RLE or lossy JPEG Baseline (Process 1).

3.3.1.1.2. Clinical Context

This application profile class facilitates the interchange of ultrasound images on USB media. Typical interchange would be between the ZONARE z.one ultrasound acquisition device and itself.

This profile is intended only for the ZONARE z.one application.

3.3.1.1.2.1 Roles and Service Class Options

This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange Option.

The Application Entity shall support one or more of the roles of File Set Creator (FSC) or File Set Reader (FSR), or File Set Updater (FSU) defined in PS 3.10.

3.3.1.1.3. General Class Profile

3.3.1.1.3.1 SOP Classes and Transfer Syntaxes

This Application Profile is based on the Media Storage Service Class with the Interchange Option (see PS 3.4).

The SOP Classes and corresponding Transfer Syntax supported by this Application Profile are specified in the following table.

Table 65. Abstract and Transfer Syntaxes

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50

3.3.1.1.3.1.1 Ultrasound Image Pixel Formats Supported

The ZONARE-USB application profile requires that all ultrasound objects only be stored using the values described in PS 3.3 US Image Module and the specializations used for the Ultrasound Image IOD.

In the role of FS-Updater or FS-Creator, the application shall choose values of image pixel module attributes as indicated in the table below.

Table 66. Ultrasound Image Pixel Formats Supported

Attribute Name	Tag	VR	Value

Samples Per Pixel	(0028,0002)	US	1
Photometric Interpretation	(0028,0004)	CS	PALETTE COLOR
Rows	(0028,0010)	US	480
Columns	(0028,0011)	US	640
Bits Allocated	(0028,0100)	US	8
Bits Stored	(0028,0101)	US	8
High Bit	(0028,0102)	US	7
Pixel Representation	(0028,0103)	US	0
Pixel Aspect Ratio	(0028,0034)	IS	1\1
Red Palette Color Lookup Table Descriptor	(0028,1101)	US	<256,0,16>
Green Palette Color Lookup Table Descriptor	(0028,1102)	US	<256,0,16>
Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	<256,0,16>

3.3.1.1.3.2 Physical Media and Media Formats

The ZONARE-USB application profile requires any of the USB Connected Removable Devices, as defined in PS 3.12.

The file system employed on these media shall be an unpartitioned FAT16 or FAT32 file system as defined in PS 3.12.

3.3.1.1.3.3 Directory Information in DICOMDIR

Conformant Application Entities shall include in the DICOMDIR File the Basic Directory IOD containing Directory Records at the Patient and the subsidiary Study and Series levels, appropriate to the SOP Classes in the File Set.

All DICOM files in the File Set incorporating SOP Instances defined for the specific Application Profile shall be referenced by Directory Records.

Note: DICOMDIRs with no directory information are not allowed by this Application Profile.

All implementations shall include the DICOM Media Storage Directory in the DICOMDIR file. There shall only be one DICOMDIR file per File Set. The DICOMDIR file shall be in the root directory of the medium.

3.3.1.1.3.3.1 Additional Keys

File Set Creators and Updaters are only required to generate the mandatory elements specified in PS 3.10. At each directory record level, any additional data elements can be added as keys, but it is not required by File Set Readers to be able to use them as keys.

3.4. Media Configuration

All local applications use the configured AE Title (Tools→Sys Setup→Dicom→General). The Application Entity Title configurable for Media Services is listed in the Table below:

Application Entity	Default AE Title
MEDIA	ZONARE

Section 4. Support of Character Sets

ZONARE z.one only supports the DICOM default character set and the character set identified by Latin alphabet 1 (i.e. “ISO_IR 100”).

Section 5. Security

ZONARE z.one provides support for some security measures; however it is assumed that ZONARE z.one is used within a secured environment. It is assumed that a secured environment includes at a minimum:

(a) Firewall or router protections to ensure that only approved external hosts have network access to ZONARE z.one.

(b) Firewall or router protections to ensure that ZONARE z.one only has network access to approved external hosts and services.

(c) Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

5.1. Security Profiles

ZONARE z.one does not support any security profile.

5.2. Association Level Security

ZONARE z.one does not support any association level security.

5.3. Application Level Security

The usage of the device may require the user to log on using a password. Access to the device may be configured using a single password; however under such circumstances, limited access may be granted without a password. Access to the device can be limited to all functionality except security and prior exams archived on the device.

Section 6. Annexes

6.1. IOD Contents

6.1.1. Created SOP Instances

Table 67 and Table 69 specify the attributes of images transmitted by ZONARE z.one.

The following tables use a number of abbreviations. The abbreviations used in the "Presence of …" column are:

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

The abbreviations used in the "Source" column:

MWL	The attribute value source Modality Worklist
USER	The attribute value source is from User input
AUTO	The attribute value is generated automatically
CONFIG	The attribute value source is a configurable parameter.

NOTE: All dates and times are encoded in the local configured calendar and time.

6.1.1.1. Ultrasound Image IOD

Table 67. IOD of Created US SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 70	ALWAYS
	Patient Demographic	Table 71	ALWAYS
	Patient Medical	Table 72	ALWAYS
Study	General Study	Table 73	ALWAYS
	Patient Study	Table 74	ALWAYS
Series	General Series	Table 75	ALWAYS
Equipment	General Equipment	Table 76	ALWAYS
Image	General Image	Table 77	ALWAYS
	Image Pixel	Table 78	ALWAYS
	Palette Color Lookup Table	Table 82	ALWAYS
	US Region Calibration	Table 83	ALWAYS
	US Image	Table 85	ALWAYS
	SOP Common	Table 88	ALWAYS
	Private Application	Table 89	ALWAYS

6.1.1.2. Ultrasound Multi-Frame Image IOD

Table 68. IOD of Created US Multi-Frame SOP Instances

IE	Module	Reference	Presence of

			Module
Patient	Patient	Table 70	ALWAYS
	Patient Demographic	Table 71	ALWAYS
	Patient Medical	Table 72	ALWAYS
Study	General Study	Table 73	ALWAYS
	Patient Study	Table 74	ALWAYS
Series	General Series	Table 75	ALWAYS
Equipment	General Equipment	Table 76	ALWAYS
Image	General Image	Table 77	ALWAYS
	Image Pixel	Table 78	ALWAYS
	Cine	Table 79	ALWAYS
	Multi-Frame	Table 80	ALWAYS
	Frame Pointers	Table 81	ALWAYS
	Palette Color Lookup Table	Table 82	ALWAYS
	US Region Calibration	Table 83	ALWAYS
	US Image	Table 85	ALWAYS
	SOP Common	Table 88	ALWAYS
	Private Application	Table 89	ALWAYS

6.1.1.3. Secondary Capture Image IOD

Table 69. IOD of Created SC SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 70	ALWAYS
	Patient Demographic	Table 71	ALWAYS
	Patient Medical	Table 72	ALWAYS
Study	General Study	Table 73	ALWAYS
	Patient Study	Table 74	ALWAYS
Series	General Series	Table 75	ALWAYS
Equipment	General Equipment	Table 76	ALWAYS
	SC Equipment	Table 86	ALWAYS
Image	General Image	Table 77	ALWAYS
	Image Pixel	Table 78	ALWAYS
	SC Image	Table 87	ALWAYS
	SOP Common	Table 88	ALWAYS
	Private Application	Table 89	ALWAYS

6.1.1.4. US Image IOD Modules

Table 70. Patient Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	From Modality Worklist or user input. Values supplied via Modality Worklist will be entered as received.	VNAP	MWL/ USER

			Values supplied via user input will contain three components (some possibly empty).		
Patient ID	(0010,0020)	LO	From Modality Worklist, user input, or generated by device.	ALWAYS	MWL/ USER/ AUTO
Issuer of Patient ID	(0010,0021)	LO	From Modality Worklist	ANAP	MWL
Patient's Birth Date	(0010,0030)	DA	From Modality Worklist or user input	VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS	From Modality Worklist or set by device to "F" if the exam type is obstetrics or gynecology.	VNAP	MWL/ AUTO
Referenced Patient Sequence	(0008,1120)	SQ	From Modality Worklist	ANAP	MWL
Patient's Birth Time	(0010,0032)	TM	From Modality Worklist	ANAP	MWL
Other Patient IDs	(0010,1000)	LO	From Modality Worklist	ANAP	MWL
Other Patient Names	(0010,1001)	PN	From Modality Worklist	ANAP	MWL
Ethnic Group	(0010,2160)	SH	From Modality Worklist	ANAP	MWL
Patient Comments	(0010,4000)	LT	From Modality Worklist or user input. Maximum 1024 characters.	ANAP	MWL/ USER

Table 71. Patient Demographic Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Patient's Address	(0010,1040)	LO	From Modality Worklist	ANAP	MWL

Table 72. Patient Medical Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Last Menstrual Date	(0010,21D0)	DA	From user input when the exam type is obstetrics or	ANAP	USER

			gynecology		

Table 73. General Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From Modality Worklist or generated by device	ALWAYS	MWL/ AUTO
Study Date	(0008,0020)	DA	Generated by device. Same as Series Date.	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Generated by device. Same as Series Time.	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	From Modality Worklist or user input	VNAP	MWL/ USER
Study ID	(0020,0010)	SH	From Requested Procedure ID in Modality Worklist or internal exam identifier that is generated by device[2]	ALWAYS	MWL/ AUTO
Accession Number	(0008,0050)	SH	From Modality Worklist or user input	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	From Requested Procedure Description in Modality Worklist or "X/Y" where X is the name of the exam type (i.e. similar to the third value of Image Type (0008,0008)) and Y is the name of the exam imaging preset (i.e. similar to the value of Series Description (0008,103E))	ALWAYS	MWL/ AUTO
Physician(s) of Record	(0008,1048)	PN	From Requesting Physician and Names of Intended Recipients of Results in Modality Worklist	ANAP	MWL
Referenced Study Sequence	(0008,1110)	SQ	From Modality Worklist	ANAP	MWL

[2] See recommendation from IHE Radiology Technical Framework, Volume II, Appendix A. Revision 5.x: IHE-5. Revision 6.0: Study ID in Tables A.1-x.

Procedure Code Sequence	(0008,1032)	SQ	From Requested Procedure Code Sequence in Modality Worklist	ANAP	MWL

Table 74. Patient Study Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnoses Description	(0008,1080)	LO	From Modality Worklist	ANAP	MWL
Admitting Diagnoses Code Sequence	(0008,1084)	SQ	From Modality Worklist	ANAP	MWL
Patient's Age	(0010,1010)	AS	Generated by device	ANAP	AUTO
Patient's Size	(0010,1020)	DS	From Modality Worklist	ANAP	MWL
Patient's Weight	(0010,1030)	DS	From Modality Worklist	ANAP	MWL
Occupation	(0010,2180)	SH	From Modality Worklist	ANAP	MWL
Additional Patient History	(0010,21B0)	LT	From Modality Worklist	ANAP	MWL
Admission ID	(0038,0010)	LO	From Modality Worklist	ANAP	MWL
Issuer of Admission ID	(0038,0011)	LO	From Modality Worklist	ANAP	MWL

Table 75. General Series Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	US	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Generated by device	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Generated by device	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Generated by device. Same as Study Date.	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Generated by device. Same as Study Time.	ALWAYS	AUTO
Protocol Name	(0018,1030)	LO	Generated by device	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Name of the exam imaging preset based on user input. May be a user-defined value or one of the following factory-defined values: Abdominal	ALWAYS	USER

			Aorta Breast EV Fetal_Heart Follicles General Hip Kidney Pelvic Pelvis Renal Scrotum Superficial Thyroid Venous		
Operators' Name	(0008,1070)	PN	From user input	ANAP	USER
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Generated by device	ALWAYS	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.3.1.2.3.3	ALWAYS	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI	Generated by device	ALWAYS	AUTO
Related Series Sequence	(0008,1250)	SQ	Generated by device when a previously completed exam has been re-opened and this series is not the first series in the exam. More than one item may be present.	ANAP	AUTO
> Study Instance UID	(0020,000D)	UI	Same as the Study Instance UID for this series.	ALWAYS	AUTO
> Series Instance UID	(0020,000E)	UI	Series Instance UID of the earlier series in the same exam as this series.	ALWAYS	AUTO
> Purpose of Reference Code Sequence	(0040,A170)	SQ	Only one item is generated by device.	ALWAYS	AUTO
>> Code Value	(0008,0100)	SH	122402	ALWAYS	AUTO
>> Coding Scheme Designator	(0008,0102)	LO	DCM	ALWAYS	AUTO
>> Code	(0008,0104)	LO	Same Indication	ALWAYS	AUTO

Meaning					
Request Attributes Sequence	(0040,0275)	SQ	From Modality Worklist	ANAP	MWL
> Requested Procedure ID	(0040,1001)	SH	From Modality Worklist	ANAP	MWL
> Scheduled Procedure Step ID	(0040,0009)	SH	From Modality Worklist	ANAP	MWL
> Scheduled Procedure Step Description	(0040,0007)	LO	From Modality Worklist	ANAP	MWL
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	From Modality Worklist	ANAP	MWL
Performed Procedure Step ID	(0040,0253)	SH	Internal exam identifier that is generated by device.	ALWAYS	AUTO
Performed Procedure Step Start Date	(0040,0244)	DA	Generated by device.	ALWAYS	AUTO
Performed Procedure Step Start Time	(0040,0245)	TM	Generated by device.	ALWAYS	AUTO
Performed Protocol Code Sequence	(0040,0260)	SQ	From Modality Worklist	ANAP	MWL

Table 76. General Equipment Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Manufacturer	(0008,0070)	LO	ZONARE	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	From Configuration	ANAP	CONFIG
Institution Address	(0008,0081)	ST	From Configuration	ANAP	CONFIG
Station Name	(0008,1010)	SH	From Configuration	ANAP	CONFIG
Institutional Department Name	(0008,1040)	LO	From Configuration	ANAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	From Configuration	ANAP	CONFIG
Device Serial Number	(0018,1000)	LO	From Configuration	ANAP	CONFIG
Software Version(s)	(0018,1020)	LO	From Configuration	ANAP	CONFIG

Table 77. General Image Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence**	**Source**

				of Value	
Instance Number	(0020,0013)	IS	Generated by device. Same as Acquisition Number.	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS		EMPTY	AUTO
Content Date	(0008,0023)	DA	Generated by device. Same as Acquisition Date and Instance Creation Date.	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Generated by device. Same as Acquisition Time and Instance Creation Time.	ALWAYS	AUTO
Image Type	(0008,0008)	CS	ORIGINAL\ PRIMARY	ALWAYS	AUTO
Acquisition Number	(0020,0012)	IS	Generated by device. Same as Instance Number.	ALWAYS	AUTO
Acquisition Date	(0008,0023)	DA	Generated by device. Same as Content Date and Instance Creation Date.	ALWAYS	AUTO
Acquisition Time	(0008,0033)	TM	Generated by device. Same as Content Time and Instance Creation Time.	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	YES or NO based upon whether or not the “Hide Info” checkbox is selected for the patient/exam.	ALWAYS	USER
Lossy Image Compression	(0028,2110)	CS	01	ANAP	AUTO
Lossy Image Compression Ratio	(0028,2112)	DS	Generated by device.	ANAP	AUTO
Lossy Image Compression Method	(0028,2114)	CS	ISO_10918_1	ANAP	AUTO
Icon Image Sequence	(0088,0200)	SQ	Generated by device	ALWAYS	AUTO
> Samples Per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
> Photometric Interpretation	(0028,0004)	CS	PALETTE COLOR	ALWAYS	AUTO
> Rows	(0028,0010)	US	240	ALWAYS	AUTO
> Columns	(0028,0011)	US	320	ALWAYS	AUTO

> Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
> Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
> High Bit	(0028,0102)	US	7	ALWAYS	AUTO
> Pixel Representation	(0028,0103)	US	0000H	ALWAYS	AUTO
> Pixel Data	(7FE0,0010)	OW/ OB	Generated by device	ALWAYS	AUTO
> Red Palette Color Lookup Table Descriptor	(0028,1101)	US	<256,0,16>	ALWAYS	AUTO
> Green Palette Color Lookup Table Descriptor	(0028,1102)	US	<256,0,16>	ALWAYS	AUTO
> Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	<256,0,16>	ALWAYS	AUTO
> Red Palette Color Lookup Table Data	(0028,1201)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO
> Green Palette Color Lookup Table Data	(0028,1202)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO
> Blue Palette Color Lookup	(0028,1203)	OW	Generated by device. Note: The values in	ALWAYS	AUTO

Table Data			both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)		

Table 78. Image Pixel Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Samples Per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	PALETTE COLOR	ALWAYS	AUTO
Rows	(0028,0010)	US	480	ALWAYS	AUTO
Columns	(0028,0011)	US	640	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
High Bit	(0028,0102)	US	7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0000H	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW/ OB	Generated by device	ALWAYS	AUTO
Red Palette Color Lookup Table Descriptor	(0028,1101)	US	<256,0,16>	ALWAYS	AUTO
Green Palette Color Lookup Table Descriptor	(0028,1102)	US	<256,0,16>	ALWAYS	AUTO
Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	<256,0,16>	ALWAYS	AUTO
Red Palette Color Lookup Table Data	(0028,1201)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly	ALWAYS	AUTO

			used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)		
Green Palette Color Lookup Table Data	(0028,1202)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO
Blue Palette Color Lookup Table Data	(0028,1203)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO

Table 79. Cine Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Frame Time Vector	(0018,1065)	DS	Generated by device	ALWAYS	AUTO

Table 80. Multi-Frame Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Number of Frames	(0028,0008)	IS	Generated by device	ALWAYS	AUTO
Frame Increment	(0028,0009)	AT	(0018,1065)	ALWAYS	AUTO

Pointer					

Table 81. Frame Pointers Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Representative Frame Number	(0028,6010)	US	1	ALWAYS	AUTO

Table 82. Palette Color Lookup Table Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Red Palette Color Lookup Table Descriptor	(0028,1101)	US	<256,0,16>	ALWAYS	AUTO
Green Palette Color Lookup Table Descriptor	(0028,1102)	US	<256,0,16>	ALWAYS	AUTO
Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	<256,0,16>	ALWAYS	AUTO
Palette Color Lookup Table UID	(0028,1199)	UI	Generated by device	ALWAYS	AUTO
Red Palette Color Lookup Table Data	(0028,1201)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO
Green Palette Color Lookup Table Data	(0028,1202)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to	ALWAYS	AUTO

			255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)		
Blue Palette Color Lookup Table Data	(0028,1203)	OW	Generated by device. Note: The values in both the most and least significant bytes of each entry are identical since there are 16 bits per entry specified and only 8 bits of value are truly used (i.e. The 8 bit intensities from 0 to 255 are scaled to the corresponding 16 bit intensities from 0 to 65535.)	ALWAYS	AUTO

Table 83. US Region Calibration Module of Created SOP Instances

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Sequence of Ultrasound Regions	(0018,6011)	SQ	Set by the device to include 2-7 regions or items. See Table 84.	ALWAYS	AUTO
> Region Location Min x_0	(0018,6018)	UL	Generated by device	ALWAYS	AUTO
> Region Location Min y_0	(0018,601A)	UL	Generated by device	ALWAYS	AUTO
> Region Location Max x_1	(0018,601C)	UL	Generated by device	ALWAYS	AUTO
> Region Location Max y_1	(0018,601E)	UL	Generated by device	ALWAYS	AUTO
> Physical Units X Direction	(0018,6024)	US	Set by the device to one of the following values: 0003H (cm) – B, CD regions 0004H (seconds) – PW, M regions	ALWAYS	AUTO
> Physical Units Y Direction	(0018,6026)	US	Set by the device to one of the following values: 0003H (cm) – B, CD, M regions 0007H (cm/sec) – PW region	ALWAYS	AUTO
> Physical Delta	(0018,602C)	FD	Generated by device	ALWAYS	AUTO

X					
> Physical Delta Y	(0018,602E)	FD	Generated by device	ALWAYS	AUTO
> Reference Pixel x_0	(0018,6020)	SL	Generated by device	ALWAYS	AUTO
> Reference Pixel y_0	(0018,6022)	SL	Generated by device	ALWAYS	AUTO
> Reference Pixel Physical Value X	(0018,6028)	FD	Generated by device	ALWAYS	AUTO
> Reference Pixel Physical Value Y	(0018,602A)	FD	Generated by device	ALWAYS	AUTO
> Region Spatial Format	(0018,6012)	US	Set by the device to one of the following values: 0001H [2D(tissue or flow)] 0002H [M-Mode (tissue or flow)] 0003H [Spectral (CW or PW Doppler) 0005H [Graphics]	ALWAYS	AUTO
> Region Data Type	(0018,6014)	US	Set by the device to one of the following values: 0001H [Tissue] 0002H [Color Flow] 0003H [PW Spectral Doppler] 000EH [Color Bar]	ALWAYS	AUTO
> Region Flags	(0018,6016)	UL	Bit zero is not set (i.e. region pixels are high priority), bit one is set (i.e. protected), bit two is not set (i.e. velocity), bits three and four are not set (i.e. unspecified scrolling region).	ALWAYS	AUTO
> Pixel Component Data Type	(0018,604E)	US	Generated by device	ALWAYS	AUTO
> Transducer Frequency	(0018,6030)	UL	Generated by device	ANAP	AUTO
> Pulse Repetition Frequency	(0018,6032)	UL	Generated by device	ANAP	AUTO

> Doppler Correction Angle	(0018,6034)	FD	Generated by device	ANAP	AUTO
> Steering Angle	(0018,6036)	FD	Generated by device	ANAP	AUTO
> Doppler Sample Volume X Position	(0018,6038)	UL	Generated by device	ANAP	AUTO
> Doppler Sample Volume Y Position	(0018,603A)	UL	Generated by device	ANAP	AUTO

Table 84. Order of US Region Calibration of Created SOP Instances

Region Spatial Format		**Region Data Type**		**Description**
Value	**Meaning**	**Value**	**Meaning**	
0001H	2D (tissue or flow)	0001H	Tissue	Full field of view for the first 2D area. This region is always defined.
0001H	2D (tissue or flow)	0001H	Tissue	Actual field of view for the first 2D area. This is different than the full field of view for the first 2D area when acoustic zoom is present. This region is always defined.
0001H	2D (tissue or flow)	0001H	Tissue	Full field of view for the second 2D area. This region is only defined if a second 2D area is active.
0001H	2D (tissue or flow)	0001H	Tissue	Actual field of view for the second 2D area. This is different than the full field of view for the second 2D area when acoustic zoom is present. This region is only defined if a second 2D area is active.
0001H	2D (tissue or flow)	0002H	Color Flow	Color flow in first 2D area. This region is only defined if color doppler is active for the first 2D area.
0001H	2D (tissue or flow)	0002H	Color Flow	Color flow in second 2D area. This region is only defined if a second 2D area is active and color doppler is active for the second 2D area.
0005H	Graphics	000EH	Color Bar	This region is only defined if color doppler is active for either the first or second 2D area.
0003H	Spectral (CW or PW Doppler)	0003H	PW Spectral Doppler	This region is only defined if PW doppler is active.

0002H	M-Mode (tissue or flow)	0001H	Tissue	This region is only defined if M mode is active.

Table 85. US Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples Per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	PALETTE COLOR	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
High Bit	(0028,0102)	US	7	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	0000H	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0000H	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	US	(0018,1065)	ANAP	AUTO
Image Type	(0008,0008)	CS	Value 3 is set to one of the following values depending on the type of the exam: ABDOMINAL GYNECOLOGY OBSTETRICS SMALL PARTS VASCULAR Value 4 is set accordingly.	ALWAYS	AUTO
Lossy Image Compression	(0008,2110)	CS	01	ANAP	AUTO
Ultrasound Color Data Present	(0028,0014)	US	Set to 1 if either Color Doppler or Power Doppler is active, otherwise 0.	ALWAYS	AUTO
Output Power	(0018,5000)	SH	Output power is expressed in percent of maximum power for given operating condition.	ALWAYS	AUTO
Transducer Data	(0018,5010)	LO	Identifier corresponding to the transducer type: 1 =	ALWAYS	AUTO

			SECTOR_PHASED, 3 = SECTOR_PHASED, 7 = SECTOR_PHASED, 64 = LINEAR, 65 = LINEAR, 128 = CURVED LINEAR, 144 = ENDOCAV_CLA		
Transducer Type	(0018,6031)	CS	One of the following values: SECTOR_PHASED LINEAR CURVED LINEAR ENDOCAV_CLA	ALWAYS	AUTO
Mechanical Index	(0018,5022)	DS	Set to value computed as per AIUM standards.	ALWAYS	AUTO
Bone Thermal Index	(0018,5024)	DS	Value set only if system display mode is set to display Bone Thermal Index	ALWAYS	AUTO
Cranial Thermal Index	(0018,5026)	DS	Value set only if system display mode is set to display Cranial Thermal Index	ALWAYS	AUTO
Soft Tissue Thermal Index	(0018,5027)	DS	Value set only if system display mode is set to display Soft Tissue Thermal Index. The value corresponds to the either the Focus Thermal Index or the Surface Thermal Index, whichever value is greater.	ALWAYS	AUTO
Soft Tissue-Focus Thermal Index	(0018,5028)	DS	Value set only if system display mode is set to display Soft Tissue Thermal Index and the Focus Thermal Index is greater than the Surface Thermal Index	ALWAYS	AUTO

Soft Tissue-Surface Thermal Index	(0018,5029)	DS	Value set only if system display mode is set to display Soft Tissue Thermal Index and the Surface Thermal Index is greater than the Focus Thermal Index	ALWAYS	AUTO
Depth of Scan Field	(0018,5050)	IS	Generated by device	ALWAYS	AUTO

Table 86. SC Image Equipment Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Conversion Type	(0008,0064)	CS	WSD	ALWAYS	AUTO
Modality	(0008,0060)	CS	US	ALWAYS	AUTO
Secondary Capture Device ID	(0018,1010)	LO	Generated by device. Same as Device Serial Number.	ALWAYS	AUTO
Secondary Capture Device Manufacturer	(0018,1016)	LO	Generated by device. Same as Manufacturer.	ALWAYS	AUTO
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	LO	Generated by device. Same as Manufacturer's Model Name.	ALWAYS	AUTO
Secondary Capture Device Software Version(s)	(0018,1019)	LO	Generated by device. Same as Software Version(s).	ALWAYS	AUTO
Video Image Format Acquired	(0018,1022)	SH	NTSC	ALWAYS	AUTO

Table 87. SC Image Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Date of Secondary Capture	(0018,1012)	DA	Generated by device. Same as Content Date, Acquisition Date, and Instance Creation Date.	ALWAYS	AUTO
Time of Secondary Capture	(0018,1013)	TM	Generated by device. Same as Content Time Acquisition Time, and Instance Creation Time.	ALWAYS	AUTO

Table 88. SOP Common Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source

				of Value	
Specific Character Set	(0008,0005)	CS	From Modality Worklist or configuration ("ISO_IR 100" if international characters enabled otherwise attribute is not sent).	ANAP	MWL/ CONFIG
SOP Class UID	(0008,0016)	UI	One of the following values: 1.2.840.10008.5.1.4.1.1.3.1 1.2.840.10008.5.1.4.1.1.6.1 1.2.840.10008.5.1.4.1.1.7	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Generated by device. Same as Content Date and Acquisition Date.	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Generated by device. Same as Content Time and Acquisition Time.	ALWAYS	AUTO
Instance Creator UID	(0008,0014)	UI	1.3.6.1.4.1.6052	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Generated by device	ALWAYS	AUTO

Table 89. Private Application Module of Created SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Private Creator	(0029,00xx)	LO	ZONARE_US_01	ANAP	AUTO
Estimated Date of Delivery	(0029,xx15)	DA	From user input when the exam type is obstetrics	ANAP	USER
Number of Pregnancies	(0029,xx20)	IS	From user input when the exam type is obstetrics	ANAP	USER
Number of Live Born Children Delivered	(0029,xx30)	IS	From user input when the exam type is obstetrics	ANAP	USER
Number of Abortions	(0029,xx40)	IS	From user input when the exam type is obstetrics	ANAP	USER
Number of	(0029,xx45)	IS	From user input when	ANAP	USER

Ectopic Pregnancies			the exam type is obstetrics		
Number of Fetuses	(0029,xx50)	IS	From user input when the exam type is obstetrics	ANAP	USER

6.1.2. Usage of Attributes from Received IOD's

Not applicable.

6.1.3. Attribute Mapping

Not applicable.

6.1.4. Coerced/Modified fields

ZONARE z.one will coerce or modify certain attributes under certain conditions. Some attributes can be modified based on user input on the workstation.

ZONARE z.one can modify the intended interpretation of the image pixel data for storage during network communication from its native photometric interpretation, which is "PALETTE COLOR", to either "RGB" or "MONOCHROME2".

ZONARE z.one can remove the Icon Image Sequence for storage during network communication.

The following table uses a number of abbreviations. The abbreviations used in the "Source" column are:

USER	The attribute value is modified from user input.
CONFIG	The attribute value is modified based on system setup.

Table 90. Coerced/Modified Fields

Attribute Name	Tag	VR	Coercion Condition	Source
Patient Module Attributes				
Patient's Name	(0010,0010)	PN	This attribute may be modified based on user input on the workstation.	USER
Patient ID	(0010,0020)	LO	This attribute may be modified based on user input on the workstation.	USER
Patient's Birth Date	(0010,0030)	DA	This attribute may be modified based on user input on the workstation.	USER
Patient's Sex	(0010,0040)	CS	This attribute may be modified based on user input on the workstation.	USER
Patient Comments	(0010,4000)	LT	This attribute may be created and/or modified based on user input on the workstation.	USER
General Study Module Attributes				

Attribute Name	Tag	VR	Coercion Condition	Source
Referring Physician's Name	(0008,0030)	PN	This attribute may be modified based on user input on the workstation.	USER
Accession Number	(0008,0050)	SH	This attribute may be modified based on user input on the workstation.	USER
General Series Module Attributes				
Operators' Name	(0008,1070)	PN	This attribute may be created and/or modified based on user input on the workstation.	USER
General Image Module Attributes				
Icon Image Sequence	(0088,0200)	SQ	This attribute is removed for storage during network communication if configured as such.	CONFIG
Image Pixel Module Attributes				
Samples Per Pixel	(0028,0002)	US	Value is reset to 3 for storage during network communication if "True Color (RGB)" is chosen as the destination's photometric interpretation.	CONFIG
Photometric Interpretation	(0028,0004)	CS	Value is reset to "RGB" for storage during network communication if "True Color (RGB)" is chosen as the destination's photometric interpretation. Value is reset to "MONOCHROME2" for storage during network communication if "Grayscale" is chosen as the destination's photometric interpretation.	CONFIG
Planar Configuration	(0028,0006)	US	This attribute is present with a value of 0 (color-by-pixel) or 1 (color-by-plane) for storage during network communication if "True Color (RGB) – Color-by-Pixel" or "True Color (RGB) – Color-by-Plane" is chosen as the	CONFIG

Attribute Name	Tag	VR	Coercion Condition	Source
			destination's photometric interpretation.	
Red Palette Color Lookup Table Descriptor	(0028,1101)	US	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Green Palette Color Lookup Table Descriptor	(0028,1102)	US	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Red Palette Color Lookup Table Data	(0028,1201)	OW	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Green Palette Color Lookup Table Data	(0028,1202)	OW	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Blue Palette Color Lookup Table Data	(0028,1203)	OW	This attribute is not present for storage during network communication if "Palette Color" is not chosen as the destination's photometric interpretation.	CONFIG
Pixel Data	(7FE0,0010)	OW/ OB	The value of this attribute may be compressed or uncompressed for storage during network communication depending upon the state of the media file, the set of proposed presentation contexts which is affected	CONFIG

Attribute Name	Tag	VR	Coercion Condition	Source
			by a user-modifiable compression parameter, and the set of accepted presentation contexts.	

6.2. Data Dictionaries

ZONARE z.one reserves private attributes in group 0029H. The private attributes are listed in the following table:

Table 91. Registry of Private DICOM Data Elements

Tag	Attribute Name	VR	VM	Attribute Description
(0029,00xx)	Private Creator	LO	1	ZONARE_US_01
(0029,xx15)	Estimated Date of Delivery	DA	1	Value of the attribute labeled “EDD” on the patient information form when the exam type is obstetrics.
(0029,xx20)	Number of Pregnancies	IS	1	Value of the attribute labeled “G” on the patient information form when the exam type is obstetrics.
(0029,xx30)	Number of Live Born Children Delivered	IS	1	Value of the attribute labeled “P” on the patient information form when the exam type is obstetrics.
(0029,xx40)	Number of Abortions	IS	1	Value of the attribute labeled “A” on the patient information form when the exam type is obstetrics.
(0029,xx45)	Number of Ectopic Pregnancies	IS	1	Value of the attribute labeled “E” on the patient information form when the exam type is obstetrics.
(0029,xx50)	Number of Fetuses	IS	1	Value of the attribute labeled “# Fetuses” on the patient information form when the exam type is obstetrics.

6.3. Coded Terminology and Templates

No coded terminology or templates are used.

6.4. Grayscale Image Consistency

The ZONARE z.one provides grayscale image consistency by means of displays (6" LCD for the scan engine and 13" LCD for the Supercart and *mini*Cart systems) which are calibrated such that equal changes in digital driving levels will result in approximately the same levels of perceptibility at all driving levels. The display characteristic curve and ambient light levels of the 13" LCD are measured in the factory using an external luminance meter. The result of the calibration is a set of monitor gamma correction LUTs that are stored within the LCD monitor of the Supercart system. The default gamma correction LUT is set based on best perceptual linearization and overall display contrast. With guidance from ZONARE personnel, the gamma correction LUT selection for the Supercart system can be changed via the lower jog dial button of the 13" LCD monitor. For the 6" LCD display on the scan engine, and for the 13” LCD on the *mini*Cart, a fixed monitor correction LUT is used which produces similar perceived contrast performance as the 13" LCD (with the default gamma LUT) on the Supercart. The perceived contrast performance can be tested by generating a ZONARE grayscale test pattern (similar to a SMPTE pattern) via software menu control (see z.one user's manual).

There is no grayscale image consistency for the external video output for the luminance characteristic curve of any display device. That is the external video output is not pre-calibrated.

The PRINT AE does not provide grayscale image consistency in printed film images. That is printer output is not pre-calibrated.

6.5. Extensions / Specializations / Privatizations

No Private SOP Classes or Meta SOP Classes are supported.

6.6. Private Transfer Syntaxes

No Private Transfer Syntaxes are supported.